

1010 Rev'd PCT/PTO 15 FEB 2002

SUBSTITUTE FORM PTO-1390 U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER 10848-019001
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S. APPLICATION NO. (If Known, see 37 CFR 1.5) <b>10/049693</b>

INTERNATIONAL APPLICATION NO. PCT/DE00/02758	INTERNATIONAL FILING DATE 12 August 2000	PRIORITY DATE CLAIMED 16 August 1999
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TITLE OF INVENTION  
METHOD AND DEVICE FOR IDENTIFYING A BIOPOLYMER SEQUENCE ON A SOLID SURFACE

APPLICANT(S) FOR DO/EO/US  
Wolf Bertling, Jorg Hassmann and Hans Kosak

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

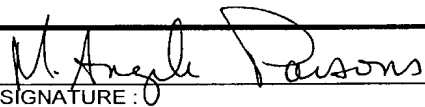
1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)).
4. ☒ The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
  - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
  - b. ☒ has been communicated by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
  - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
  - b. ☒ have been communicated by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
8. ☒ An English language translation of amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 16 below concern other documents or information included:

11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.  
☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:

- ☒ PCT International Search Report (4 pages) with eight references attached
- ☐
- ☐
- ☐

CERTIFICATE OF MAILING BY EXPRESS MAIL		Express Mail Label No <b>EL734687256US</b>
I hereby certify under 37 CFR §1.10 that this correspondence is being deposited with the United States Postal Service as Express Mail Post Office to Addressee with sufficient postage on the date indicated below and is addressed to the Commissioner for Patents, Washington, DC 20231		
<u>15 February 2002</u> Date of Deposit	<u>Juan Reopelle</u> Signature	<u>Juan Reopelle</u> Typed Name of Person Signing

U.S. APPLICATION NO. (IF KNOWN) <b>10/049693</b>		INTERNATIONAL APPLICATION NO. PCT/DE00/02758		ATTORNEY'S DOCKET NUMBER 10848-019001	
17. <input checked="" type="checkbox"/> The following fees are submitted: <b>Basic National Fee ( 37 CFR 1.492(a)(1)-( 5) ):</b> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... <b>\$1040</b>  International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... <b>\$890</b>  International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... <b>\$740</b>  International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... <b>\$710</b>  International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) ..... <b>\$100</b>  <div style="text-align: right;"><b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b></div>				<b>CALCULATIONS PTO USE ONLY</b>	
Surcharge of <b>\$130</b> for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$0.00	
Claims	Number Filed	Number Extra	Rate		
Total Claims	14 - 20 =		x <b>\$18</b>	\$0.00	
Independent Claims	4 - 3 =	1	x <b>\$84</b>	\$84.00	
MULTIPLE DEPENDENT CLAIMS(S) (if applicable)			+ <b>\$280</b>	\$0.00	
<b>TOTAL OF ABOVE CALCULATIONS =</b>				\$974.00	
<input checked="" type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27. The fees indicated above are reduced by 1/2.				\$487.00	
<b>SUBTOTAL =</b>				\$487.00	
Processing fee of <b>\$130</b> for furnishing the English Translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f))				\$0.00	
<b>TOTAL NATIONAL FEE =</b>				\$487.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). <b>\$40.00</b> per property +				\$0.00	
<b>TOTAL FEES ENCLOSED =</b>				\$487.00	
				Amount to be refunded:	\$
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a. <input checked="" type="checkbox"/> A check in the amount of \$487.00 to cover the above fees is enclosed. b. <input type="checkbox"/> Please charge my Deposit Account No. 06-1050 in the amount of \$0.00 to cover the above fees. A duplicate copy of this sheet is enclosed. c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 06-1050. A duplicate copy of this sheet is enclosed.					
<b>NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive  (37 CFR 1.137(a) or (b) must be filed and granted to restore the application to pending status.</b>					
SEND ALL CORRESPONDENCE TO:					
Mark S. Ellinger, Ph.D. FISH & RICHARDSON P.C., P.A. 60 South Sixth Street Suite 3300 Minneapolis, MN 55402 (612) 335-5070 phone (612) 288-9696 facsimile			<div style="text-align: center;">   SIGNATURE: </div> <div style="text-align: right; margin-top: 10px;"> M. Angela Parsons, Ph.D.  NAME </div> <div style="text-align: right; margin-top: 10px;"> 44,282  REGISTRATION NUMBER </div>		

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. :

U.S. National Serial No. :

Filed :

PCT International Application No. : PCT/DE00/02758

VERIFICATION OF A TRANSLATION

I, Susan POTTS BA ACIS

Director to RWS Group plc, of Europa House, Marham Way, Gerrards Cross, Buckinghamshire, England declare:

That the translator responsible for the attached translation is knowledgeable in the German language in which the below identified international application was filed, and that, to the best of RWS Group plc knowledge and belief, the English translation of the international application No. PCT/DE00/02758 is a true and complete translation of the above identified international application as filed.

I hereby declare that all the statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the patent application issued thereon.



Date: January 22, 2002

Signature of Director :

For and on behalf of RWS Group plc

Post Office Address :

Europa House, Marham Way,  
Gerrards Cross, Buckinghamshire,  
England.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Wolf Bertling et al. Art Unit : Unknown  
Serial No. : Examiner : Unknown  
Filed :  
Title : METHOD AND DEVICE FOR IDENTIFYING A BIOPOLYMER SEQUENCE  
ON A SOLID SURFACE

Assistant Commissioner for Patents  
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Prior to examination, please amend the application as follows:

In the Specification:

Please add the following paragraph to the application after the title:

**--CROSS-REFERENCE TO RELATED APPLICATIONS**

This application is a National Stage application under 35 U.S.C. §371 and claims benefit under 35 U.S.C. §119(a) of International Application No. PCT/DE00/02758 having an International Filing Date of August 12, 2000, which claims benefit of DE 199 38 138.0 filed on August 16, 1999.--

Please delete the paragraph on page 2, lines 1-3.

In the Claims:

Please cancel claims 1-10.

Please add the following new claims 11-24. Claims 11-24 are pending.

11. A process for the identification of an anti-counterfeiting mark, comprising the steps of:

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15 February 2002

Date of Deposit

Signature

*Joan Rcopelle*

Joan Rcopelle

Typed or Printed Name of Person Signing Certificate

Applicant : Wolf Bertling et al.  
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applying an anti-counterfeiting mark to a surface of a first substrate as a layer with electro-active metal atoms, ions, clusters or complex molecules, wherein the anti-counterfeiting mark is a first biopolymer,

contacting the first biopolymer with a second biopolymer applied as a layer with electro-active metal atoms, ions, clusters or complex molecules, wherein the second biopolymer has affinity to the first biopolymer, thereby generating a biopolymer-biopolymer complex,

applying an electrical current to the biopolymer-biopolymer complex, and measuring an electrical property of the biopolymer-biopolymer complex, thereby identifying the presence of the anti-counterfeiting mark.

12. The process of claim 11, wherein the electrical current is a direct current.
13. The process of claim 11, wherein the electrical current is an alternating current.
14. The process of claim 11, wherein the electrical property measured is a change in impedance/conductivity.
15. The process of claim 11, wherein the electrical property measured is a function of a superimposed alternating-voltage or alternating-current frequency.
16. The process of claim 11, wherein the electrical property measured is a change in voltage.
17. The process of claim 11, wherein the electrical property measured is a change in amplitude.
18. The process of claim 11, wherein the electrical property measured is a change in phase.
19. The process of claim 11, wherein measuring the electrical property is carried out by a reference electrode and/or a counter-electrode.
20. An apparatus for identifying an anti-counterfeiting mark, comprising:  
a second biopolymer applied to a surface of a second substrate as a layer with electro-active metal atoms, ions, clusters or complex molecules,  
a device for applying an electrical current and/or a device for measuring an electrical property.
21. The apparatus of claim 20, wherein the second biopolymer is applied to an insulator provided on the surface of the second substrate.

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22. The apparatus of claim 20, further comprising a reference electrode and/or a counter-electrode.

23. A process for the identification of an anti-counterfeiting mark applied to a surface of a first substrate as a layer with electro-active metal atoms, ions, clusters or complex molecules, wherein the anti-counterfeiting mark is a first biopolymer, said method comprising the steps of:

contacting the first biopolymer with at least one second biopolymer applied to a surface of a second substrate as a layer with electro-active metal atoms, ions, clusters or complex molecules, wherein the second biopolymer has affinity to the first biopolymer, thereby generating a biopolymer-biopolymer complex,

applying an electrical current to the biopolymer-biopolymer complex, and  
measuring an electrical property of the biopolymer-biopolymer complex, thereby identifying the presence of the anti-counterfeiting mark.

24. A first substrate marked with an anti-counterfeiting mark, wherein the first substrate has been marked by:

providing the first substrate to be marked with an anti-counterfeiting mark applied to a surface of the first substrate as a layer with electro-active metal atoms, ions, clusters or complex molecules, wherein the anti-counterfeiting mark is a first biopolymer,

wherein for identification of the anti-counterfeiting mark, there is provided at least one second biopolymer applied to a surface of a second substrate as a layer with electro-active metal atoms, ions, clusters or complex molecules, wherein the second biopolymer has affinity to the first biopolymer thereby generating a biopolymer-biopolymer complex, wherein an electrical current is applied to the biopolymer-biopolymer complex, and wherein an electrical property of the biopolymer-biopolymer complex is measured, thereby identifying the presence of the anti-counterfeiting mark.

In the Abstract:

Please add the attached Abstract to the application after the claims.

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Filed :  
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### REMARKS

Applicants respectfully request entry of the amendments and remarks submitted herein. Claims 1-10 have been canceled, and new claims 11-24 have been added. Support for new claims 11-24 can be found in the originally filed claims and throughout the specification. Claims 11-24 are currently pending. Attached is a marked-up version of the changes being made by the current amendments. Reconsideration of the pending application is respectfully requested.

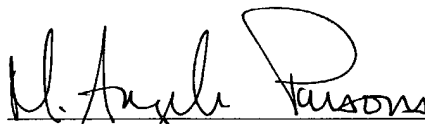
In addition, Applicants amended the specification to include a paragraph describing related applications and to claim the benefit of priority to such applications. Applicants also have amended the specification to remove the paragraph on page 2 that refers to claim numbers, and to add an Abstract. The attached Abstract is the English language Abstract that was published with the PCT application. Therefore, Applicants submit that there is no new matter introduced by these amendments.

### CONCLUSION

Applicants ask that claims 11-24 be examined. The enclosed filing fee takes into account the new claims added by this Preliminary Amendment. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: February 15, 2002

  
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Reg. No. 44,282

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60072005 doc

Applicant : Wolf Bertling et al.  
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 Filed :  
 Page : 5

Attorney's Docket No.: 10848-019001 / 412045GA-go

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

The following paragraph was added to the application after the title:

**--CROSS-REFERENCE TO RELATED APPLICATIONS**

This application is a National Stage application under 35 U.S.C. §371 and claims benefit under 35 U.S.C. §119(a) of International Application No. PCT/DE00/02758 having an International Filing Date of August 12, 2000, which claims benefit of DE 199 38 138.0 filed on August 16, 1999.--

The paragraph on page 2, lines 1-3 has been deleted.

In the Claims:

Please cancel claims 1-10.

New claims 11-24 have been added.

In the Abstract:

The Abstract on the attached page has been added to the application.



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Patent Claims

1. A process for the identification of an anti-counterfeiting mark in the form of a first biopolymer  
5 applied to a surface of a first substrate,

where the first biopolymer is applied to the surface as a layer with electro-active metal atoms, ions, clusters or complex molecules introduced therein in order to  
10 amplify electrical measurement quantities,

where the first biopolymer is brought into contact with a second biopolymer which has affinity thereto and which has been applied to a surface of a second  
15 substrate as a layer with electro-active metal atoms, ions, clusters or complex molecules introduced therein in order to amplify electrical measurement quantities, and

20 where the identification of the first biopolymer is carried out by evaluation of the change in the electrical measurement quantity impedance or conductivity caused by the adhesion due to the affinity.

25 2. A process as claimed in claim 1, where the change in the impedance or conductivity in the direct- and/or alternating-current region is measured as a function of a superimposed alternating-voltage or alternating-  
30 current frequency.

3. A process as claimed in claim 1 or 2, where at least one of the surfaces is electrically conductive, and the change over this surface is measured.

35 4. A process as claimed in claim 3, where the surfaces are separated by an insulator.

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5. A process as claimed in the preceding claims,  
where the determination of the change is carried out by  
means of a reference electrode and/or a counter-  
5 electrode.

6. An apparatus for carrying out the process as  
claimed in one of the preceding claims,  
10 where a first biopolymer is applied to a surface of a  
first substrate in such a way that it can be brought  
into contact with a second biopolymer which has  
affinity thereto and which has been applied to a  
surface of a second substrate,

15 where the first and second biopolymer are on the  
surface in the form of a layer, and the layer is  
provided with electro-active metal atoms, ions,  
clusters or complex molecules in order to amplify  
20 electrical measurement quantities, and

where, for the identification of the first biopolymer,  
a device is provided for the evaluation of a change in  
the electrical measurement quantity impedance or  
25 conductivity caused by the adhesion due to the  
affinity.

7. An apparatus as claimed in claim 6, where the  
change in the direct-current and/or alternating-current  
30 region as a function of a superimposed alternating-  
voltage or alternating-current frequency can be  
measured by means of the evaluation device.

8. An apparatus as claimed in claim 6 or 7, where at  
35 least one of the surfaces is electrically conductive,  
and the change can be measured over this surface.

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9. An apparatus as claimed in one of claims 6 to 8, where the first and/or second biopolymer has been applied to an insulator provided on the surface.
- 5 10. An apparatus as claimed in one of claims 6 to 9, where a reference electrode and/or a counterelectrode is/are provided.

**ABSTRACT OF THE DISCLOSURE**

The invention relates to a method for identifying a biopolymer spread on a first surface of a solid substrate, whereby the first biopolymer is brought into contact with a second biopolymer which spread on a second surface, whereby said second biopolymer has an affinity for the first biopolymer.

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**Process and apparatus for the identification of a biopolymer sequence on the surfaces of solids**

5 The invention relates to a process and an apparatus for the identification of a specific biopolymer sequence which is bound to the surface of a solid.

10 US 5,780,234 discloses detecting the state of hybridization by changing the electrical conductivity. To this end, it is necessary, according to the teaching of US 5,780,234, that transfer of free electrons takes place. For this purpose, the nucleic acid sequences are combined with electron donors or acceptors. If hybridization takes place, charge transport can occur.

15 The adduction of the oligonucleotide to be detected takes place from solution here.

Further processes for the identification of a polymer sequence are disclosed in WO 99/29898, US 5,065,798,

20 WO 98/48275, US 5,866,336 and WO 99/11813.

It is known from H.W. Fink, C. Schönenberger, Nature **398**, 407 (1999) that the conductivity of individual DNA double strands is in the order of magnitude of good

25 semiconductors or conductive polymers.

S.O. Kelley, N.M. Jackson, M.G. Hill, J.K. Barton, Angew. Chem. Inter. Ed. Engl. **38**, 941 (1999) disclose that monolayers of DNA double strands on electrode

30 surfaces have high conductivity and faster charge transfer, even over large separations.

The object of the invention is to provide a novel technology by means of which biopolymers immobilized on

35 a solid surface can be identified unambiguously, quickly and sensitively.

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This object is achieved by the features of Claims 1 and 7. Advantageous embodiments arise from the features of claims 2 to 6 and 8 to 12.

5 According to the invention, a process is provided for the identification of a first biopolymer applied to a first surface of a first substrate, where the first biopolymer is brought into contact with a second biopolymer which has affinity thereto and which is  
10 located on a surface of a second substrate, and where the identification of the first biopolymer is carried out by evaluation of the change in impedance or conductivity caused by the adhesion due to the affinity.

15 The term biopolymer is taken to mean, in particular, a polymer formed from nucleotides or amino acids, for example DNA, RNA, PNA, PTO, peptide, protein and the like. The term biopolymer which has affinity is taken  
20 to mean a biopolymer which is able to form a bond to a corresponding biopolymer. The bond can be a covalent, ionic or hydrogen bond. Bonding caused by steric effects is also possible.

25 Electronic detection of the change in conductivity between two surfaces which occurs, for example, on hybridization increases the sensitivity and specificity and reduces the apparatus complexity.

30 Possible areas of application of the process according to the invention are in medical diagnostics, identification, coding and recognition technology.

The change that can be measured is the change in  
35 impedance or conductivity in the direct-current and/or alternating-current region as a function of a superimposed alternating-voltage or current frequency. It is possible here for one of the surfaces to be

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electrically conductive and for the change over this surface to be measured. However, the surfaces may also be separated by an insulator. The first and/or second biopolymer may be applied to the surface in the form of a layer, with electro-active metal atoms, ions, clusters or complex molecules being introduced therein. According to a further embodiment, it is provided that the determination of the change is carried out by means of a reference electrode and/or a counterelectrode.

10

The invention furthermore relates to an apparatus for carrying out the process according to the invention, where a first biopolymer is applied to the surface of a first substrate in such a way that it can be brought into contact with a second biopolymer which has affinity thereto and which has been applied to a surface of a second substrate, and where, for the identification of the first biopolymer, a device is provided for the evaluation of a change in the impedance or conductivity caused by the adhesion due to the affinity.

20

Embodiments of the invention are explained below. The identification according to the invention of the biopolymer on the surface of a solid is advantageously carried out by the following procedure:

25

The first biopolymers immobilized on the surface of the first substrate are brought into contact with second biopolymers which have affinity thereto. This results in hybridization. The second biopolymers may be immobilized on a surface of a second substrate and be brought into contact with the first biopolymers to be identified, for example by pressing onto one another. A suitable substrate material is glass, plastic or metal. The latter may be in the form of a foil.

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When hybridization takes place between two parallel surfaces, the change in the conductivity between the two surfaces can be used for detection. This applies in both embodiments both for direct-current and alternating-current conductivity phenomena. In order to increase the conductivity, metal atoms, ions, clusters or complex molecules may also be intercalated into the thin films formed from the biopolymers. Alternatively, the detection can also take place via fluorescence or other optical methods. Conductive clusters can be employed here for amplification of optical signals.

In an embodiment, nucleic acids of a certain sequence are covalently bonded, as first biopolymers to be identified, to a conductive surface of the first substrate. Complementary nucleic acids are bound to a second conductive substrate, which is brought into contact with the first by pressing onto one another. If hybridization of the nucleic acids takes place, the electrical resistance drops. This can be detected by conventional electronic methods.

It is also possible to detect the changes in the capacitances in the hybridizing layer alternating-current resistances which accompany the hybridization. Furthermore, it is also possible to employ the use of electrochemical signals, such as, for example, specific reduction and oxidation peaks, for identification of the hybridization.

The electronic measurement quantities can be amplified by introducing metal atoms, clusters or ions into the layer of the biopolymers to be detected. This can take place either before or after the hybridization, for example by vapor deposition or electrochemical methods. Furthermore, it is also possible to use complex molecules which add specifically onto single-stranded structures or also as intercalators onto double-



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stranded conformations and which have electro-active centers.

The process according to the invention can be used, for example, in the area of security technology for the marking and identification of bank notes, smart cards, identity cards and the like to prevent counterfeiting. In the case of identification using a liquid phase, the process can also be employed for the marking and identification of, for example, foods, medicaments or the like.

Example:

Oligonucleotides having a length of 21 bases are covalently immobilized at the 5'-end to the surface of a conductive polycarbonate/carbon fiber plastic.

The oligonucleotides located on the surface are hybridized with complementary probes located on a second surface. This is carried out by bringing the two surfaces into contact. If an alternating voltage having a frequency of 250 Hz is applied between the conductive plastic surface and the second surface and the capacitive proportion of the alternating current is measured, a drop in the alternating-current conductivity by more than 10% arises in the case of hybridization. Hybridization of the oligonucleotide can thus be detected. Control experiments using non-specific oligonucleotides do not produce any significant change in conductivity.

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## Patent Claims

1. A process for the identification of a first biopolymer applied to a surface of a first substrate,

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where the first biopolymer is brought into contact with a second biopolymer which has affinity thereto and which is located on a surface of a second substrate, and

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where the identification of the first biopolymer is carried out by evaluation of the change in impedance or conductivity caused by the adhesion due to the affinity.

15

2. A process as claimed in claim 1, where the change in the impedance or conductivity in the direct- and/or alternating-current region is measured as a function of a superimposed alternating-voltage or alternating-current frequency.

20

3. A process as claimed in claim 1 or 2, where at least one of the surfaces is electrically conductive, and the change over this surface is measured.

25

4. A process as claimed in claim 3, where the surfaces are separated by an insulator.

30

5. A process as claimed in the preceding claims, where the first and/or second biopolymer is applied as a layer to the surface, with electro-active metal atoms, ions, clusters or complex molecules being introduced therein.

35

6. A process as claimed in the preceding claims, where the determination of the change is carried out by means of a reference electrode and/or a counter-electrode.

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7. An apparatus for carrying out the process as claimed in one of the preceding claims, where a first biopolymer is applied to a surface of a first substrate  
5 in such a way that it can be brought into contact with a second biopolymer which has affinity thereto and which has been applied to a surface of a second substrate, and where, for the identification of the first biopolymer, a device is provided for the evaluation  
10 of a change in the impedance or conductivity caused by the adhesion due to the affinity.

8. An apparatus as claimed in claim 7, where the change in the direct-current and/or alternating-current  
15 region as a function of a superimposed alternating-voltage or alternating-current frequency can be measured by means of the evaluation device.

9. An apparatus as claimed in claim 7 or 8, where at  
20 least one of the surfaces is electrically conductive, and the change can be measured over this surface.

10. An apparatus as claimed in one of claims 7 to 9, where the first and/or second biopolymer has been  
25 applied to an insulator provided on the surface.

11. An apparatus as claimed in one of claims 7 to 10, where the first and/or second biopolymer is/are in the form of a layer on the surface, and the layer is  
30 provided with electro-active metal atoms, ions, clusters or complex molecules.

12. An apparatus as claimed in one of claims 7 to 11, where a reference electrode and/or a counterelectrode  
35 is/are provided.

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES  
PATENTWESENS (PCT) VERÖFFENTLICHTE INTERNATIONALE ANMELDUNG

(19) Weltorganisation für geistiges Eigentum  
Internationales Büro



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**Veröffentlicht:**

— Ohne internationalen Recherchenbericht und erneut zu veröffentlichen nach Erhalt des Berichts.

Zur Erklärung der Zweibuchstaben-Codes, und der anderen Abkürzungen wird auf die Erklärungen ("Guidance Notes on Codes and Abbreviations") am Anfang jeder regulären Ausgabe der PCT-Gazette verwiesen.

(54) **Title:** METHOD AND DEVICE FOR IDENTIFYING A BIOPOLYMER SEQUENCE ON A SOLID SURFACE

(54) **Bezeichnung:** VERFAHREN UND VORRICHTUNG ZUR IDENTIFIKATION EINER BIOPOLYMERSEQUENZ AUF FESTKÖRPEROBERFLÄCHEN

(57) **Abstract:** The invention relates to a method for identifying a biopolymer spread on a first surface of a solid substrate, whereby the first biopolymer is brought into contact with a second biopolymer which spread on a second surface, whereby said second biopolymer has an affinity for the first biopolymer; Biopolymer in Kontakt gebracht wird und wobei die Identifikation des ersten Biopolymers vorgenommen wird durch Auswertung der durch affinitätsbedingte Adhäsion ausgelösten Änderung der Impedanz, der Leitfähigkeit im Gleichstrom- und/oder Wechselstrombereich in Abhängigkeit von einer aufgeprägten Wechselspannungs- oder Wechselstromfrequenz.

(57) **Zusammenfassung:** Die Erfindung betrifft ein Verfahren zur Identifikation eines auf einer ersten Oberfläche eines Festkörpersubstrats aufgetragenen ersten Biopolymers, wobei das erste Biopolymer mit einem dazu affinen, zweiten sich auf einer zweiten Oberfläche befindenden Biopolymer in Kontakt gebracht wird und wobei die Identifikation des ersten Biopolymers vorgenommen wird durch Auswertung der durch affinitätsbedingte Adhäsion ausgelösten Änderung der Impedanz oder der Leitfähigkeit im Gleichstrom- und/oder Wechselstrombereich in Abhängigkeit von einer aufgeprägten Wechselspannungs- oder Wechselstromfrequenz.

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**COMBINED DECLARATION AND POWER OF ATTORNEY** 17 JUN 2002

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and joint inventor of the subject matter which is claimed and for which a patent is sought on the invention entitled *Method and Device For Identifying a Biopolymer Sequence on a Solid Surface*, the specification of which:

- ☐ is attached hereto.  
☒ was filed on February 15, 2002 as Application Serial No. 10/049,693.  
☐ was described and claimed in PCT International Application No. \_\_\_\_\_ filed on \_\_\_\_\_ and as amended under PCT Article 19 on \_\_\_\_\_.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information I know to be material to patentability in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

Country	Application No.	Filing Date	Priority Claimed
PCT	PCT/DE00/02758	August 12, 2000	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Germany	199 38 138.0	August 16, 1999	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section

**Combined Declaration and Power of Attorney**

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1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patents issued thereon.

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